ISG3 Working; Group 1 Schedule

Monday

Plenary
Group discussion and status of results:
- K. Kubo – BNS and tolerances in JLC linac
- PT – Alignment thoughts
- G. Stupakov – girder and structure tolerances
- Z. Li – Optimization of S- and L-band structures

Tuesday

Group discussion and status of results:
- K. Bane – Optimization of S- and L-band wakefields
- M. Woodley – Deck sharing

Common session with Structure group:
- G. Stupakov - girder and structure tolerances and wakefield based on DDS3 alignment data
- PT – Alignment strategies
- R. Jones – BBU in present RDDS1 design

Wednesday

Common session with Injectors group:
- S. Kuroda – JLC Pre-DR and main DR
- P. Emma – NLC DR lattice

Common session with IR group:
- T. Raubenheimer – A FODO based collimation section?
- PT – Collimator wakefield experiment
- J. Frisch – Self-healing collimators
- K. Kubo – KEK-B crab cavity

Thursday

Lattice translation discussion
Further discussion on JLC/NLC DRs and plans for ISG4

11/19/98

Tasks for ISG3 (1/25—1/28)

S- and L-band Structures:

- Determination of L-band structure parameters – Zenghai Li
- Optimization of S-band wakefields – Karl Bane

In progress
fine for 2.8ns

Beam charge tolerances:

- Systematic and random effects on ΔE/E – Zenghai Li started - not discussed
- Effects on trajectory (calculated later by Karl Bane and Peter Tenenbaum) Single bunch

BNS Configuration:

- Verify BNS configuration versus oscillations starting at different points along the main linac and compare required energy overhead – (NLC) Gennady Stupakov; (JLC) Kiyoshi Kubo
  Need 3 - 4% overhead
- Verify BNS configuration versus trajectory correction algorithm in main linac – (NLC) Peter Tenenbaum; (JLC) Kiyoshi Kubo
- Verify BNS configuration versus ATL type errors – (NLC) Gennady Stupakov; (JLC) ??
  Need to consider feedback

Injection Jitter Tolerances:

- X, x', y, y', dx/dz, dy/dz effects on trajectory and emittance and BNS configuration
  - Main NLC linacs – Gennady Stupakov (No time to discuss)
  - Main JLC linacs – Kiyoshi Kubo
  - S- and L-band linacs – Zenghai Li and Tor Raubenheimer
  - NLC Bunch compressor rf – Tor Raubenheimer Not completed for X-band BC2.

Klystron/Modulator Failure:

- Effects of klystron or modulator failure on rf voltage from structures
  Verified by Z. Li - not discussed

RF Tolerances:

- Voltage and phase versus time effecting ΔE/E
  - Main NLC linacs – Kathy Thompson ?? started - not discussed
  - Main JLC linacs – Kiyoshi Kubo
  - S- and L-band linacs – Zenghai Li
  - NLC Bunch compressor rf – Zenghai Li
- Voltage and phase versus time effecting trajectory and emittance
  - Main NLC linacs – Peter Tenenbaum/Karl Bane
  - Main JLC linacs – Kiyoshi Kubo

single bunch effects completed

11/19/98

Tasks for ISG3 (1/25—1/28)

Linac Alignment:

- Describe meaning of alignment tolerances and models in relation to trajectory correction – these are primarily single bunch effects
  - NLC trajectory correction – Peter Tenenbaum
  - NLC alignment model – Gennady Stupakov
  - JLC trajectory correction and alignment – Kiyoshi Kubo

  completed
- Structure internal alignment: models compared with data – Gennady Stupakov done
- RF deflections and bookshelving – Gennady Stupakov done - not discussed
- Data on structure alignment – Juwen and Higo-san

  Modeled by Gennady

Bunch Compressor Designs:

- Gather requirements, parameters, tolerances, and lattices for comparison
  - JLC – Kaoru Yokoya
  - NLC – Tor Raubenheimer

  Not discussed - probably little problem in future

Collimation System Designs:

- Gather requirements, parameters, tolerances, and lattices for comparison
  - JLC – Kaoru Yokoya
  - NLC – Tor Raubenheimer

  No comparison.
  - & Complete NLC FODO design – Tor Raubenheimer status - lots of questions

Crossing Angle:

- Model outgoing beam in JLC design with small crossing angle using NLC extraction line – Yuri Nosochkov Not done - working on NLC version
- Get parameters and requirements on KEK-B crab cavity – Kiyoshi Kubo
- Discuss rf stability in SLAC S-band crab cavity design – Joe Frisch

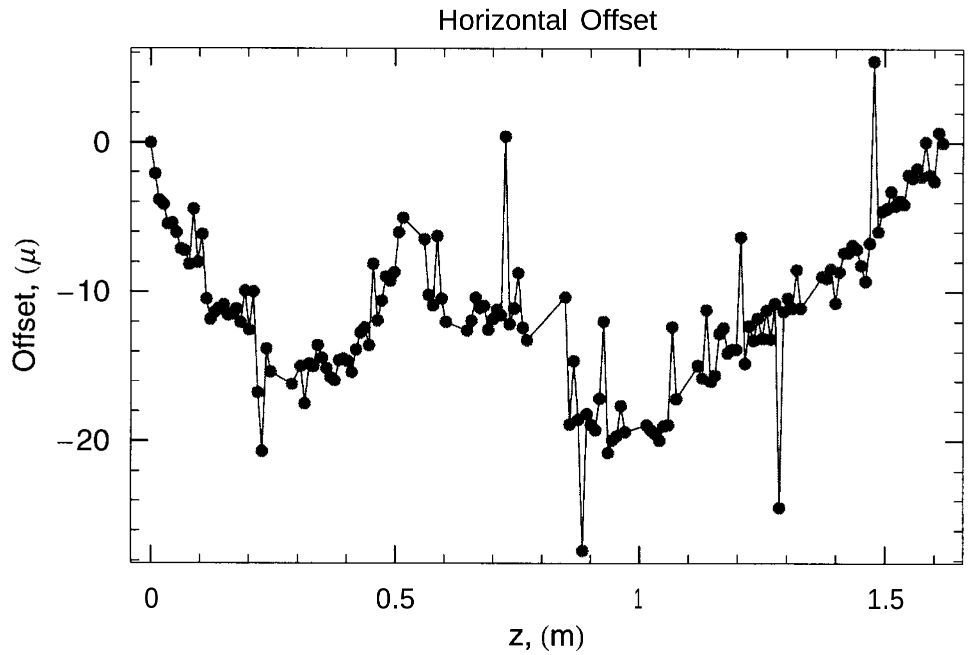
Damping Ring and Pre-DR Requirements:

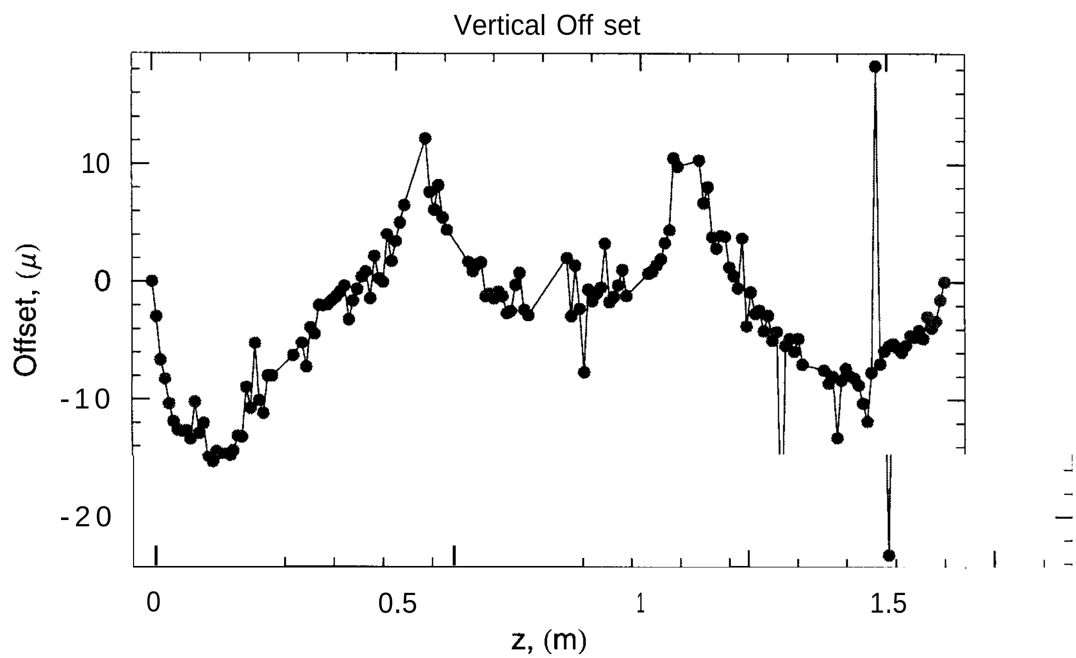
- Gather requirements on the damping and pre-damping rings
  - JLC – Kaoru Yokoya/Hayano
  - NLC – Tor Raubenheimer/Marc Ross

Charge Requirements:

- Gather maximum charge requirements at IP through the sources (or vise-versa) including overheads for higher-ems energy or γ-γ collisions
  - JLC – Kaoru Yokoya
  - NLC – Tor Raubenheimer

Raw data: offset vs z





Vertical Emittance Growth due to LR Wake

$$\Delta\epsilon_N = e^4 N^2 \bar{\beta}_0 N_a L_a^2 (S_a)^2_{rms} \left[\frac{1 - (E_0/E_f)^{1/2}}{E_0^{1/2} E_f^{3/2}} \right]$$

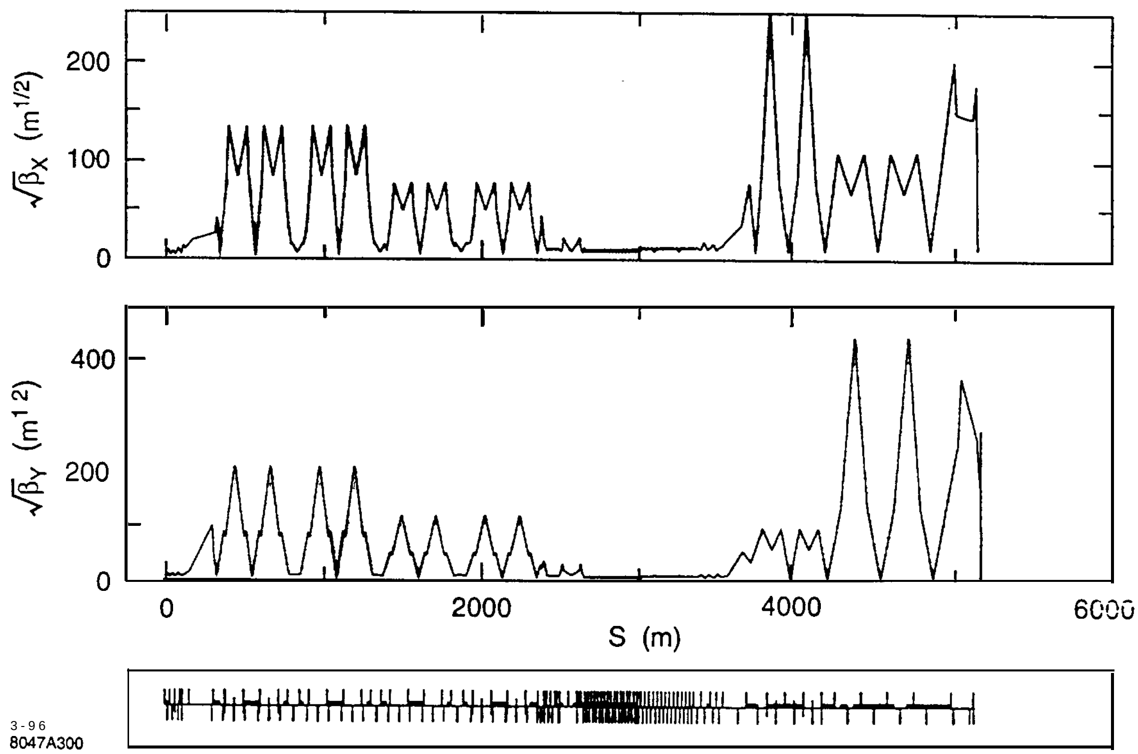
where $S_a = 0.015$ V/pC/m.

$$\Delta\epsilon_N = 1.7 \times 10^{-9}\text{m}$$

or

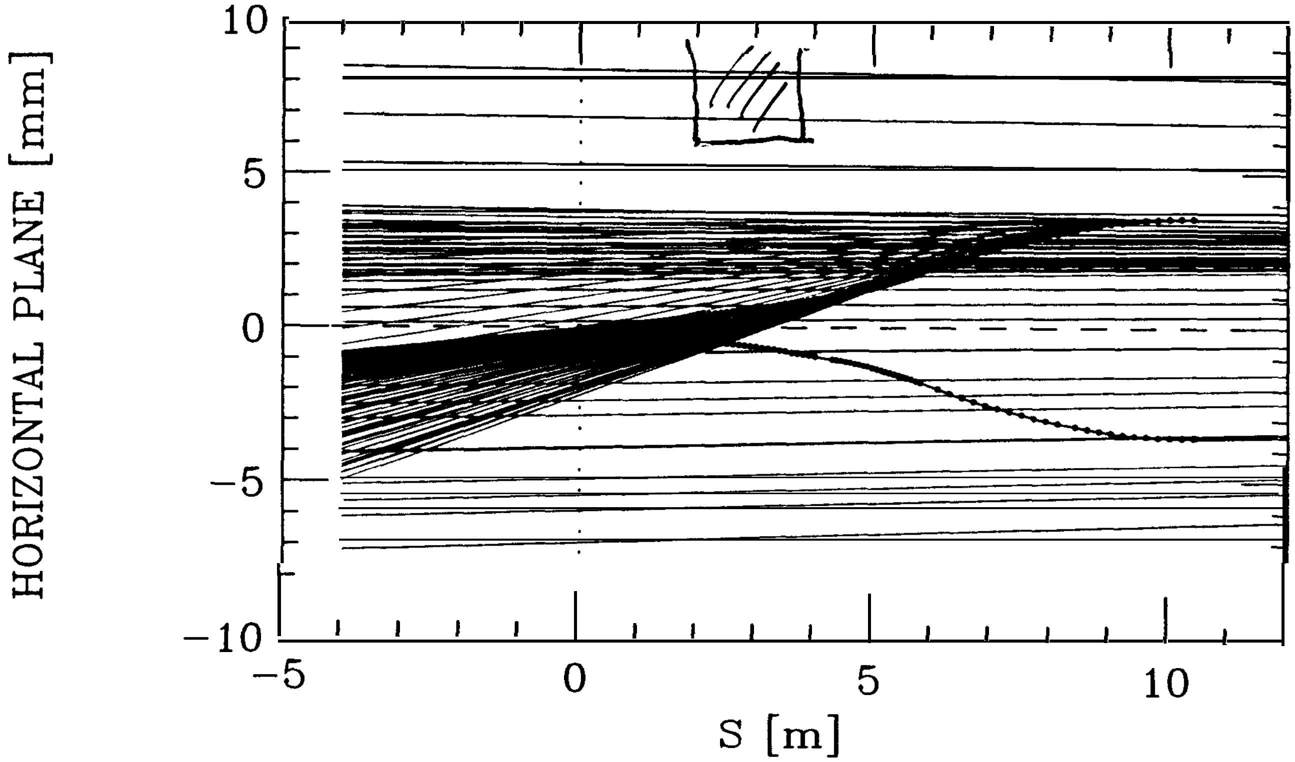
$$\frac{\Delta\epsilon_N}{\epsilon_N} = \mathit{0.04}$$

ZDR Beam Delivery



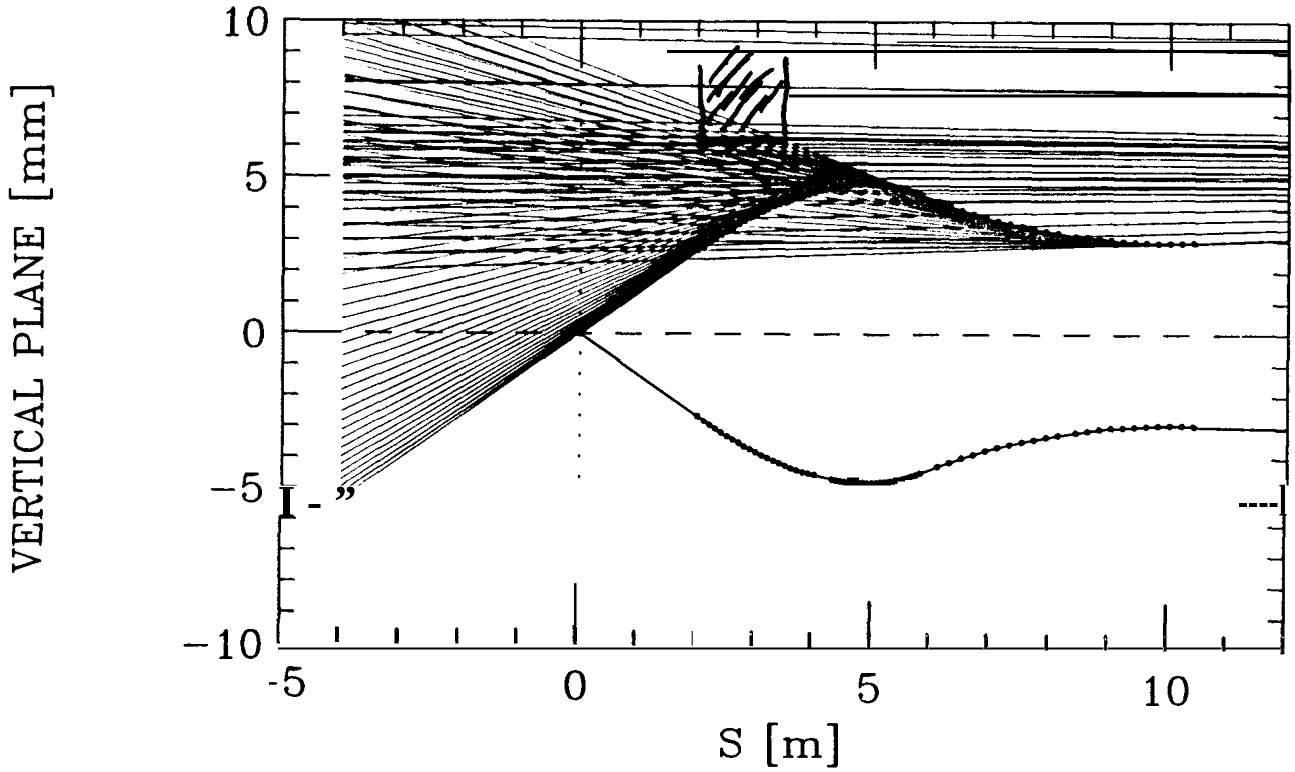
← Collimator →

X vs S for 10.00 σ * 20. μrad



40-45σ

Y vs S for 50.00 σ * 27. μrad



Pre-linac collimation isolates DR, BC1, and pre-linac - this leaves main linac and BC2

<u>Problems</u> magnet failure - slow/infreq.
rf phase/voltage - fast/often

Need to look in more detail at BC2 rf failure effects but we could get partial protection with long wave guide and have self-protection due to large loading - every bunch will have different phase and energy.

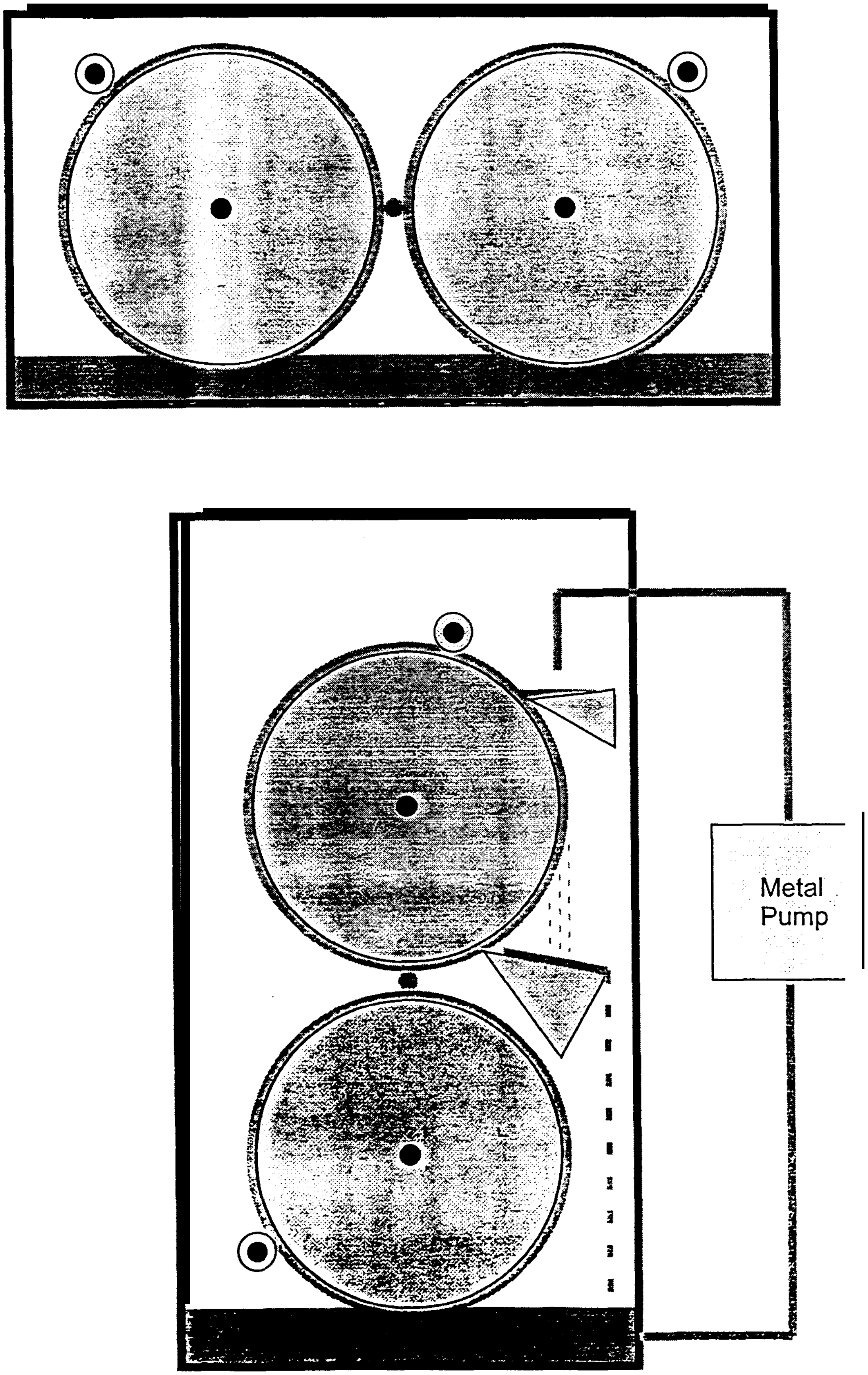
Passive Protection or Not?

Pre linac collimation isolates DR BC1 and pre linac – this leaves main linac and BC2.

Problems magnet failure – slow/infreq.
rf – fast / often

Need to look in more detail at BC2 rf failure but partial protection with long wave guide and self-protection with loading.

Liquid Metal Film Collimator Concept



check sad ring / trpt

M. Woodley

Comment X

XSIF/SAD Element Definition Comparison

~~XSIF~~ [redacted]		SAD	
Keyword	**Attributes**	Kevword	Atributes
MARKER	TYPE Comment	MARKER comment	**AX,BX,AY,BY,EX,EPX,EY,EPY, R1,R2,R3,R4,DX,DPX,DY,DPY, DZ,DDP,EMITX,EMITY,DP,AZ, SIGS,GEO,OFFSET**
DRIFT	**L,TY**PE	DRIFT	**L,RADIUS**
F1 Fringe **SBEND**	**L,ANGLE,E1,E2,K1,K2,H1,H2, HGAP,FINT,FINTX,TILT,~~TYPE~~**	**BEND** Sector	**L,ANGLE,E1,E2,K1,ROTATE, F1,FRINGE,K0,~~RANKICK~~, ~~DX,DY,DISFRIN,DISRAD,EPS~~** comment
QUADRUPOLE	**L,K1,TILT,~~APERTURE,TYPE~~**	QUADRUPOLE	**L,K1,ROTATE,~~F1,F2,FRINGE,~~ ~~DX,DY,DISFRIN,DISRAD,EPS~~** Comment
SEXTUPOLE	**L,K2,TILT,~~APERTURE,TYPE~~**	SEXTUPOLE	**L,K2,ROTATE, ~~DX,DY,DISFRIN,DISRAD~~**
OCTUPOLE	**L,K3,TILT,~~APERTURE,TYPE~~**	OCTUPOLE	**L,K3,ROTATE, ~~DX,DY,DISFRIN,DISRAD~~**
		DECAPOLE ~~Comment~~	**~~L~~,K4,ROTATE, ~~DX,DY,DISFRIN,DISRAD~~** Map to multipole
		DODECAPOLE ~~Comment~~	**~~L~~,K5,ROTATE, ~~DX,DY,DISFRIN,DISRAD~~**
MULTIPOLE	L or LRAD,KOL through **K20L**, TO through **T20,TILT,SCALEFAC,** APERTURE,TYPE	**MULTIPOLE**	L,KO through K21 **,SK0** through SK2 **1** ,ROTATE,RADIUS, **F1,F2,FRINGE,** FREQ,VOLT,HARM,PHI,DPHI, **DX,DY,DZ,CHI1,CHI2, ~~DISFRIN,DISRAD,EPS~~**
Comment **SOLENOID**	L,KS,APERTURE,TYPE	SOLENOID	**BOUND,BZ,DX,DY,DZ,DPX, DPY,CHI1,CHI2,CHI3,GEO** Comment
RFCAVITY	**L,VOLT,LAG,HARMON,FREQ, ELOSS,~~LFILE,TFILE,NBIN,~~ ~~BINMAX,APERTURE,TYPE~~** Comment	CAVITY	**L,VOLT,PHI,DPHI,HARM,FREQ, ~~V1,V20,V11,V02,RANVOLT,~~ ~~RANPHASE,DX,DY,ROTATE~~** comment
LCAVITY	**L,E0,DELTAE,PHI0,FREQ, ELOSS,~~LFILE,TFILE,NBIN,~~ ~~BINMAX,APERTURE,TYPE~~** Com	**TCAVITY** Comment	**L,PHI,HARM,FREQ,V1,K0, ~~RANKICK,RANPHASE,~~ ~~DX,DY,ROTATE~~** bye bye
SROT	**ANGLE,TYPE**	COORD	**DX,DY,CHI1,CHI2,CHI3,DIR**
YROT	ANGLE,TYPE		
MONITOR	L,TYPE		
HMONITOR	L,TYPE		
VMONITOR	**L,TYPE**		
BLMONITOR	L,TYPE		??
SLMONITOR	L,TYPE		
IMONITOR	L,TYPE		
PROFILE	L,TYPE		
WIRE	L,TYPE		
INSTRUMENT	L,TYPE		
HKICK	**L,KICK,TILT,TYPE**		Bend K0≠0 Angle=0
VKICK	**L,KICK,TILT,TYPE**		
RCOLLIMATOR	L,XSIZE,YSIZE,TYPE	APERTURE	DX1,**DX2,DY**1,**DY2,DP**
ECOLLIMATOR	**L,XSIZE,YSIZE,TYPE**		

Twiss values written as parameters

$$\int_{f_m}^{f_{m+1}} \tfrac{1}{2K}\lambda S_0 df_s = 1 \qquad (2.2)$$

This enables all the cell synchronous frequencies to be determined and hence the new ten parameters are determined.

This procedure is implemented in the following section to calculate the spectral function and associated wake function for DDS 3.

3. Calculation of the Wake function

In the revised design for DDS 3 we chose a truncated Gaussian distribution for the uncoupled $2Kdn/df_{syn}$ distribution, with a bandwidth of 4.71 units of sigma, (a bandwidth of 10.159% of the central frequency and sigma is 2.125% of the central frequency) and this provides a basis for the determination of the 206 synchronous frequencies. The kick factor weighted density function for DDS 3 and DDS 1 are shown in Fig 1.

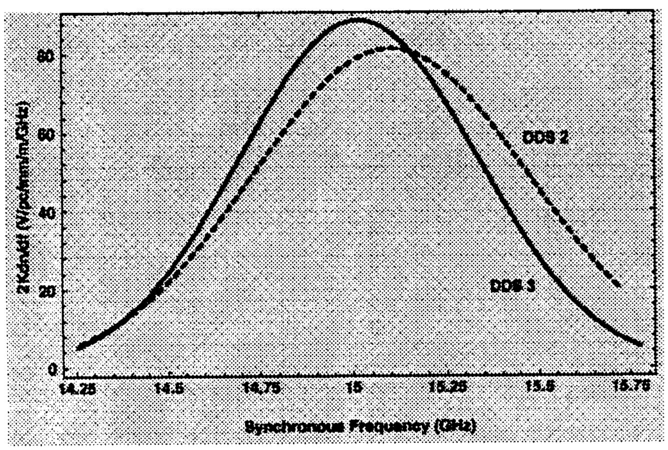


Figure 1: Twice the kick factor weighted density function for DDS 2 (shown dashed) and the corresponding function for the re-designed DDS3 and 4

It is evident that DDS 2 is markedly asymmetric and this adversely affects the sharpness and depth of the minima for the short range wake

In order to calculate the wake function we first are required to calculate the spectral function associated with the 9 mapped parameters. This spectral function calculated for DDS 3, and shown in Fig 2, maintains the Gaussian characteristics imposed upon it from the synchronous frequency distribution but modulated with oscillations of large amplitude (resulting in a large part from reflections occurring in the higher order mode couplers in the manifold).

Also, the spectral function exhibits the underlying damped mode structure as mentioned previously for DDS 2 [1] and is shifted with respect to the 2Kdn/df curves, as given in Fig. 1. The difference between the respective curves in Fig. 1 and Fig. 2 becomes more pronounced for higher frequencies becoming more highly perturbed as one progresses down towards the higher energy end of the structure where the coupling to the manifold has been designed to be largest. These coupled synchronous frequencies will be discussed in a future publication [2]

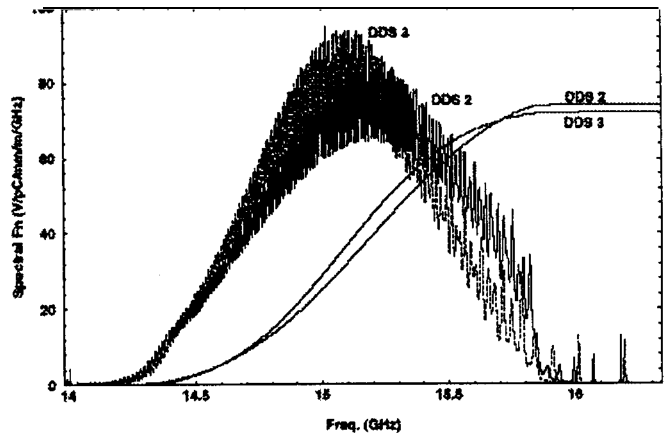


Figure 2: Spectral function for DDS 2 and DDS 3

It is important to note that the sharp, rather precipitous, fall-off in the spectral function in DDS 2 at approximately 15.8 GHz has detrimental affects on the short range wake function. In DDS 3 the spectral function falls off smoothly and gradually and this has beneficial effects on the range wake function in that it enables a faster fall-off to occur. Indeed for a perfectly smooth termination, which we refer to as our idealised case [1], it is possible to achieve more than an order of magnitude weaker wake function at the 90 bunch point.

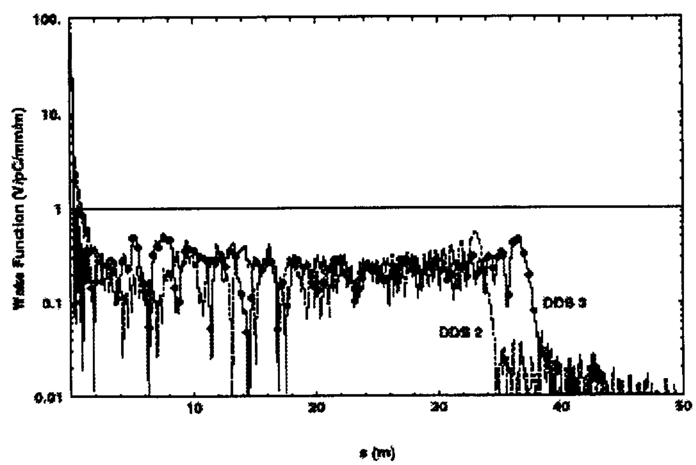


Figure 3: Long range wake function for DDS 2 (shown dashed) and DDS 3. The points are at the location of each of the bunches, of which there are ninety.

It is interesting to note that the maxima of DDS 3 is a little larger than that of its counterpart DDS 2. However, the area under the curve (bounded by the upper & lower synchronous frequencies for each structure) corresponding to DDS 3 is slightly smaller than DDS 2. This reduction in the area of

M. Woodley

SAD ⇔ XSIF translator issues

- purpose of translated decks: study optics as is, or modify optics?
- a common subset of allowed element attributes has to agreed on . . . the translator program will only translate these attributes and will ignore all others
- keyword mappings need to be established . . . should a BLMON element (bunch length monitor) from an XSIF deck be translated into a MARKer or a zero-length drift, or what?
- the mapping of attribute values between SAD and XSIF needs to be specified (units, sign convention, phase convention, fringe field parameters, assumed default values, *etc.)*
- do we want to maintain parameter usage in translated decks, or just do the arithmetic in the translator and give all attributes numerical values?
- does SAD allow beamlines with "formal arguments", No ~~and [redacted] o, do we [redacted] to maintain the formal arguments in the translated deck or just~~ fully expand the beamline ~~that is actually USEd?~~ with arguments
- some information is needed for actually generating the optics for a given lattice (such as beam energy, input beam emittances, Twiss parameters, *etc.);* this can be included in a translatable file as specially named parameters, or even as specifically formatted comments
- all optics programs involved should be available at both SLAC and KEK . . . the SLAC programs are running on Windows NT, while SAD runs on unix
- can the SAD "input parser" be separated from the rest of the program, as the XSIF parser can? do we write FORTRAN, or do this is some scripting language like PERL?
- ~~who does the work?~~
  - PT XSIF -> SAD
  - Kubo-san SAD -> XSIF
- Kuroda-san ~~move~~ install SAD on SLAC
- Mark W. gather Mad -> Unix
  PT ~~install~~ -> Kuroda-san Dimad

APPLICATION OF A MAPPING FUNCTION TECHNIQUE TO THE DESIGN OF DAMPED DETUNED STRUCTURES AND TO THE RAPID CALCULATION OF THEIR WAKEFIELDS

R.M. Jones†, N.M. Kroll†‡ and R.H. Miller†
†Stanford Linear Accelerator Center, M/S 26, P.O Box 4349, Stanford, CA 94309
‡University of California, San Diego, La Jolla, CA 92093-03 19.

Abstract

In order to reduce the dipole wake encountered by the first few bunches accelerated in a multi-bunch NLC scenario the DDS (damped detuned structure) was re-designed such that a much improved Gaussian fall-off occurs in the initial wake-function. From the 9 parameterised model of DDS1 we use a mapping function to allow DDS 3 & 4 to be modeled and hence avoid additional and prohibitively time consuming MAFJA runs. The equivalent circuit parameters and geometrical parameters are treated as functions of the synchronous frequency and are readily mapped onto the new synchronous frequencies. The new geometrical parameters form a family where each is associated with the iris diameter.

1. Introduction

The first ever manifold DDS was designed such that the geometrical parameters (iris radius and cavity radius) of the cells were inverse functions of error functions, Erf. Further, the mode density function (the reciprocal of the derivative of the uncoupled frequencies with respect to mode number: dn/df) was prescribed to be Gaussian. However, the short range dipole wake function, is given by twice the inverse transform of the dipole kick-factor (K) weighted density function and under a Gaussian prescription of dn/df, 2Kdn/df is markedly asymmetric. The consequence of the asymmetry is a poor definition of the minima in the short range wake function. DDS 3 & 4 have been re-designed under a Gaussian 2Kdn/df prescription with a bandwidth of 4.71 units of sigma (with sigma 2.125% of the central frequency of the Gaussian) and this leads to a significantly improved short-range wake function.

The inverse Fourier transform of the spectral function [1] allows the global wake-function to be evaluated. However, in order obtain the new spectral function, all nine parameters of the structure must be obtained for 206 cells. This is a substantial computational task in running the MAFIA code required for the spectral function and in the careful fitting procedure required for all the new functions. However, the method used herein obviates this excessive computational work and requires that we fit all the 9 circuit model parameters together with the beam kick-factor to ten functions which all depend on the synchronous frequency only. The new set of new synchronous frequencies, dictated in our case by the requirement that 2Kdn/df be Gaussian, allows the 206 x 10 new characteristic parameters to be calculated. Similarly the 5 parameters, which define the geometry of the structure (the iris radius a, cavity radius b, iris thickness t, the radial distance of the edge of the manifold from the center of of a cell, H and the height of the manifold L) are also functionally dependent on the synchronous frequency of the beam and, under a new set of frequencies, 5 x 206 new dimensions are calculated for the DDS. Thus, in order to obtain the wake function and new geometrical parameters for fabrication all that is necessary is to obtain 15 functions.

However, under this new mapping one might express some concern as to whether the properties of the fundamental (i.e. accelerating) mode have been adversely affected and so with this in mind we conducted an intensive investigation as to the deviation of the cell dimensions, parameterised by the cavity diameter 2b, from their values designed in DDS 2 (all dimensions form an invariant family parameterised by the cavity diameter b). This is detailed in section 4 and successive sections.

2. The Mapping Function

In our design of DDS 2 we chose eleven representative sections to obtain frequency-phase pairs from detailed MAFJA simulations and hence obtain ten model parameters (nine circuit parameters plus the cell kick-factors) for each of the eleven sections. Parameters for all sections are subsequently obtained by error function fits and interpolation. A similar procedure may be followed to determine the five geometric parameters (i.e., cell and manifold dimensions) for all the sections from those for the original eleven. This is a substantial task for each structure design. However, as we now have all fifteen parameters as a function of synchronous frequency, we can take advantage of this functional dependence to explore new design distributions and to obtain the set of section dimensions which would be needed to realize them.

Based on our fit parameters we prescribe a smooth uncoupled spectral function, $S_0(f_s)\lambda$ and impose the condition that: $2K(f_s)dn/df = S_0(f_s)\lambda$, where K is the uncoupled kick factor, f_s the synchronous frequency and, λ is a scale factor to be determined. The upper and lower truncation bounds on the synchronous frequencies are imposed, f_{s1} and f_{sN} and the normalisation condition is obtained:

$$\lambda = N / \int_{f_{s1}}^{f_{sN}} (\tfrac{1}{2} S_0 / K) df_s \qquad (2.1)$$

Then the new synchronous frequencies are determined according to:

Pre-Damping Ring/Damping Ring

S.Kuroda(KEK)

Pre DR

Pre DR@ISG2 bunch spacing 2.8 nsec
# of bunch: 90
# of bunch train : $N_{train} = 1$
Rep.Rate : 150 Hz

--> Short Insertion Region for RF & INJ/EXT

==> Pre DR with $N_{train} = 2$

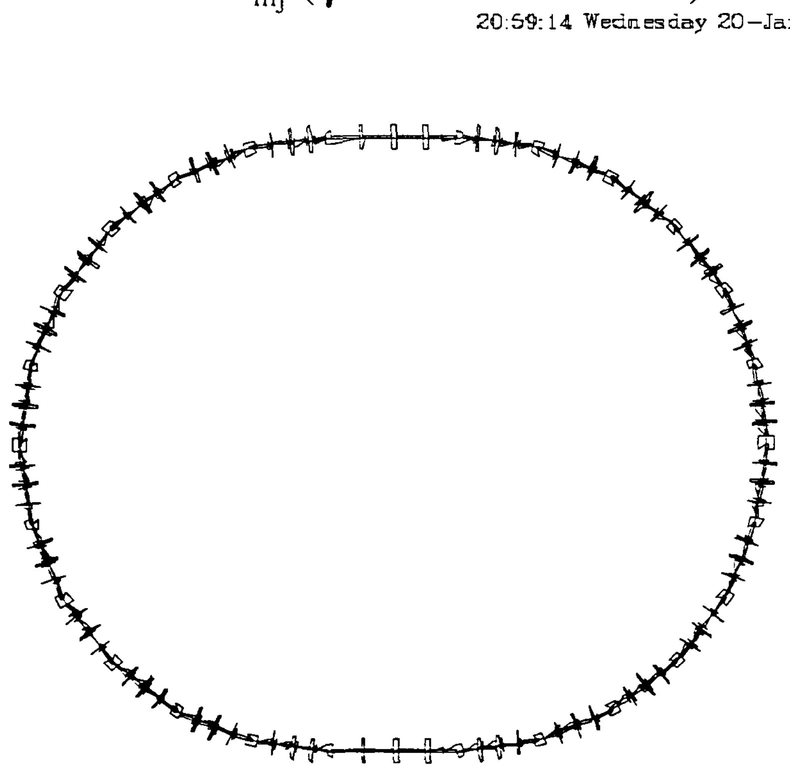
Injected Positron Beam

$\gamma\varepsilon_{in} \approx 3 \times 10^{-3}$ m

Goal for the Extraction Beam

$\gamma\varepsilon_{ext} \approx 1 \times 10^{-4}$ m

Acceptance > 3 σ_{inj} ($\gamma\varepsilon$ > 0.027 m.rad) & dp<±2%



geometry of the ring

origin (since the wake function is given by the inverse transform of the spectral function) and this is in itself a consequence of the larger iris dimension in DDS 3.

4. Geometrical Parameters

Each of the five geometrical parameters are fitted with an interpolation function, the independent variable in each case being the synchronous frequency. Thence, armed with these new synchronous frequencies the new 206 x 5 parameters are readily obtained. Both a new and mapped cell parameter is shown in Fig. 4 and a manifold parameter in Fig. 5. The end points of DDS 2 and DDS 3 are identical by design so that no extrapolation is required in the determination of the DDS 3 parameters. Thus, in determining all parameters only third order interpolation between cell points has been employed, with a view to minimising any error in the generation of the new points.

It is evident from the curves that in the downstream end (or low energy end) of the structure the parameters are very close to that of the DDS 2 design whereas in the upstream end both the iris and the cavity diameter are increased significantly. This is a consequence of the asymmetry in the original design in which the kick factor weighted distribution reached too low a level in the upstream location of the structure and this has been corrected for in DDS 3. The thickness of the irises however, is reduced with respect to DDS 2, but this reduction is sufficiently small that the structure still maintains its mechanical integrity.

The manifold is tapered as one goes down the structure to enhance the coupling. This increased coupling is necessary because the modal composition of TE/TM is reduced as one moves towards the upstream end of the structure and to achieve a Q value in the neighborhood of a 1000 or so, increased coupling is required. There is a reverse in the taper towards the end cells in the upstream end and this is instituted in order to lower the cut-off frequency of the HOM (higher order mode) coupler and hence improve the match of the mitered bend of the HOMs at the lower frequency end of the band.

It is necessary to have well-matched HOM loads because the wake function is very sensitive to the power reflected back into the accelerator [1]. However, under the mapping the middle cell has effectively shifted forward by 11 cells and hence the upward taper (which occurs in cells 182 to 202 for DDS 2) maps the up-taper into a region where there are no manifold cells. Thus, in DDS 3 we change the mapped taper in this region by increasing the gradient of the taper and withdrawing its to cell 202. This will adversely affect the wake function but we are confident that its deleterious effect will minimal.

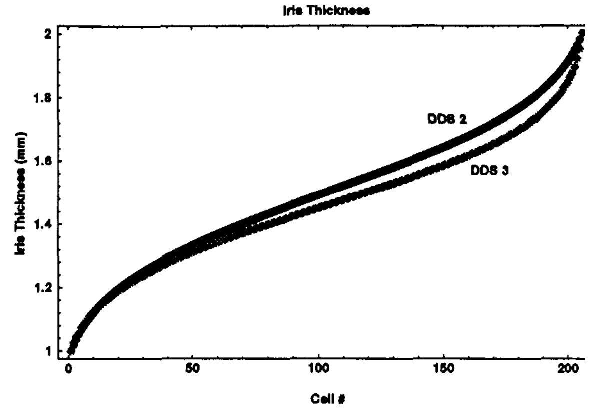


Figure 4 Cell geometrical parameters: iris thickness, t.

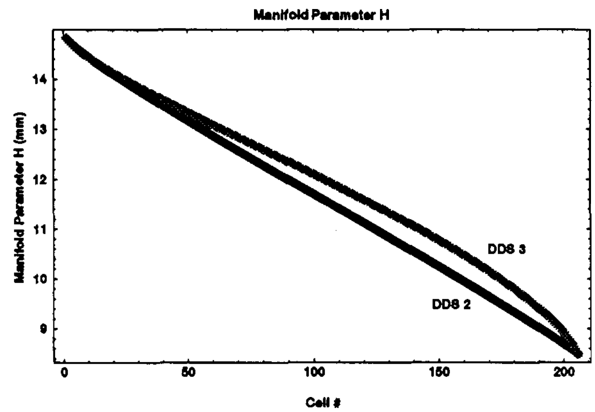


Figure 5: Manifold geometrical parameters: radial distance of the edge of the manifold the from center of a cell.

5. Conclusions

We have developed a method to rapidly design new DDSs based upon a mapping procedure. This method enables both the wake function and the new geometry of the structure to be evaluated. Indeed, we have applied this method to calculate the short range wake function for DDS 3 and we find that, on average, the wake function is reduced by a factor of 5 or more. The new geometrical parameters form an invariant family which are functionally dependent on the cavity iris diameter, 2 and the deviation of the new family of parameters from the old provides an indication as to the accelerating mode's phase advance of the new structure.

6. Acknowledgments

This work is supported by Department of Energy grant number DE-FG03-93ER40759‡ and DE-AC03-76SF00515†.

7. References

[1] R.M. Jones, et al. A Spectral Function Method Applied to the Calculation of the SLAC Damped Detuned Structure. Proc. Intl. Linac Conf. Geneva Switzerland, 1996 (and SLAC-PUB 7287)

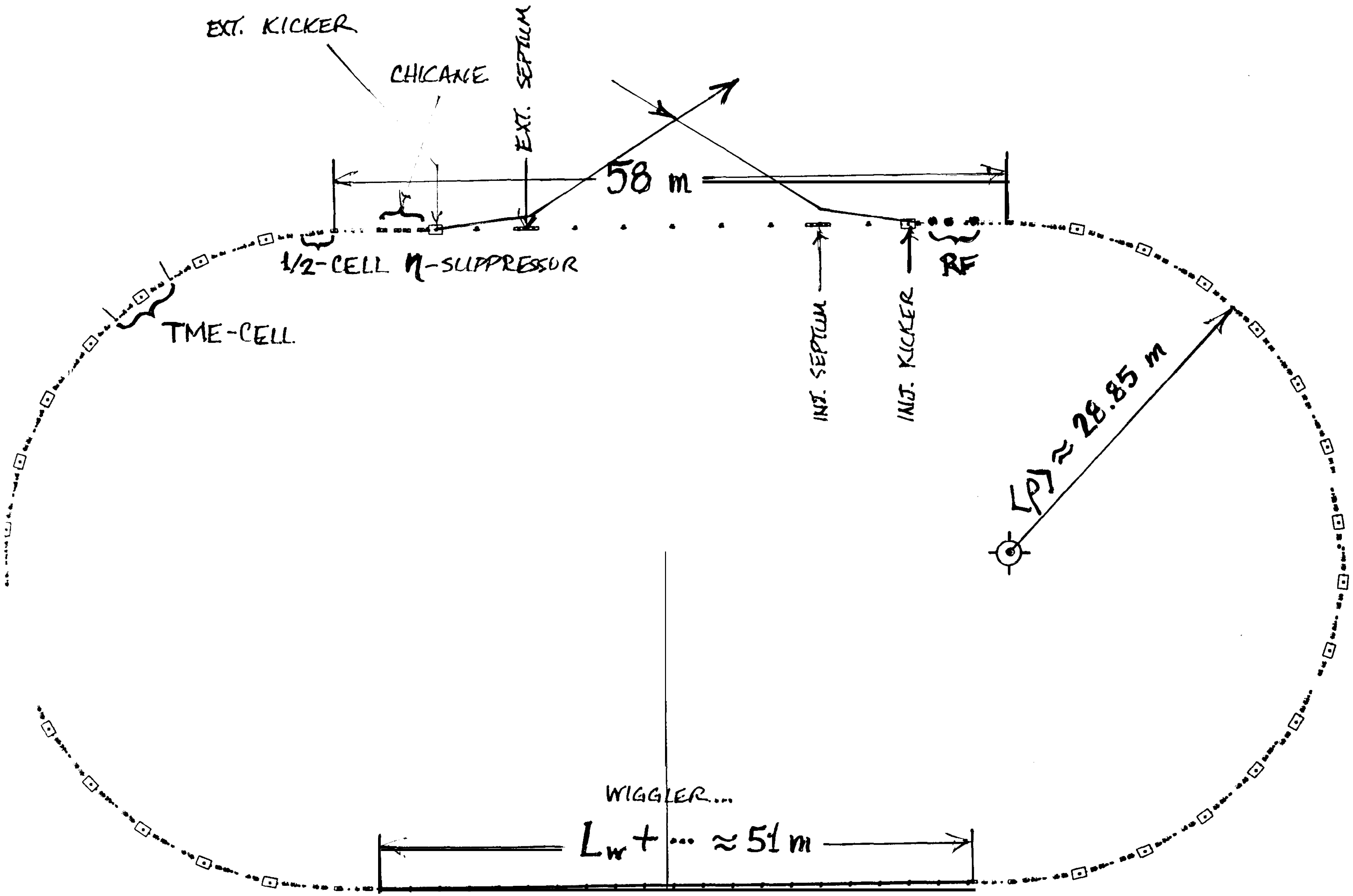
[2] N.M. kroll, The SLAC Damped Detuned Structure, Concept and Design, SLAC-PUB7589, PAC97

DR with bunch spacing 2.8 nsec
# of bunch: 90

Parameters

	FOBO (racetrack/square)	TME (square)	FODO
Equilibrium Emittance $\gamma\varepsilon_x$	2.2×10^{-6} m	2.9×10^{-6} m	--------
Damping Time τ_y	4.2 msec	4.4 msec	--------
Momentum Compaction Factor α	$(5.7/5.4)\times10^{-4}$	4.8×10^{-4} (ok ?)	--------
Number of Cells	40	40	60
k(B)	-0.67 m^{-1}	0	0
L(B)	1.2 m	0.9 m	0.37 m
# of Wiggler Magnets	72	72	--------
Dynamic Aperture w/o Error (dp<±1%)	--------	--------	--------
Misalignment Tolerance			

NLC MAIN DAMPING RING LAYOUT (JAN. 25, 1999)



JLC / NLC Damping Ring Lattices

Main DR

	JLC	NLC
$\gamma\varepsilon_{inj}$(mm-mrad)	100	150
NT	6.9	4.8
Rep. Rate (Hz)	150	120
$\gamma\varepsilon_{in'j} * e^{-2N_\tau}$(mm-mrad)	0.0001	0.01
$\gamma\varepsilon_{ext}$ (mm-mrad)	3/0.03	310.03
#bunch/train	95	95
At / bunch (ns)	2.8	2.8
At for kicker (ns)	65	65

Pre-DR

	JLC	N L C
$\gamma\varepsilon_{inj}$(m-rad)	0.003 (rms)	0.09 (edge)
$N\tau$	2.0	3.2
Rep. Rate (Hz)	150	120
$\gamma\varepsilon_{inj} * e^{-2N_\tau}$ (mm-mrad)	52	100 (rms)
$\gamma\varepsilon_{ext}$(mm-mrad)	84 / 52	150 (rms)
#bunch/train	95	95
At / bunch (ns)	2.8	2.8
At for kicker (ns)	65	65

Note: $\gamma\varepsilon_{ext} = \gamma\varepsilon_{inj} * e^{-2N_\tau} + \gamma\varepsilon_0 * (1 - e^{-2N_\tau})$

Agree on pulse train and extracted beam properties. Differences on input beams, damping requirement, and repetition rate. Optimize both designs and compare performance parameters at ISG4.

Tasks for ISG4 (my opinion)

- Make a task list for ISG4!
- Complete task list for ISG3

- Agree on BNS overhead (not on BNS phases)
- Agree on final energy spectrum
- Further discussion on 2 vs. 3 structures per girder
- Further discussion on correction procedures
- Document present parameter choices
- Document present emittance, charge, and jitter budgets
- Document present sensitivity calculations with preliminary tolerances No names assigned yet!!

- Reconsider e+ source parameters
- Start Pre-DR design
- Study main DR dynamic aperture

- Complete XSIF <–> SAD translation routines